UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

December 23, 2015

Mr. Mano Nazar
President and Chief Nuclear Officer
Nuclear Division
NextEra Energy
P.O. Box 14000
Juno Beach, FL 33408-0420

SUBJECT: TURKEY POINT NUCLEAR GENERATING UNIT NO. 4 – RELIEF REQUEST NO. 17, FOR THE FOURTH 10-YEAR INSERVICE INSPECTION INTERVAL REGARDING THE AMOUNT OF COVERAGE OBTAINED DURING SPECIFIC EXAMINATIONS (CAC NO. MF5797)

Dear Mr. Nazar:

By letter dated February 13, 2015, as supplemented by letter dated September 25, 2015, Florida Power & Light Company (FPL or the licensee) submitted Relief Request No. 17 for the fourth 10-year inservice inspection (ISI) interval of Turkey Point Nuclear Generating Unit No. 4. Pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR), Part 50, Section 55a(g)(5)(iii), the licensee requested the U.S. Nuclear Regulatory Commission (NRC) relief pertaining to the amount of coverage obtained during specific examinations compared to the coverage required by the American Society of Mechanical Engineers (ASME) Code.

Based on the review of the submittals, the U.S. Nuclear Regulatory Commission (NRC) staff concluded that compliance with the ASME Code coverage requirements is impractical for the configurations identified in the subject relief requests, and that compliance with the specified requirements would result in a burden on FPL. The NRC staff also concluded that the examination coverages obtained by the licensee provide reasonable assurance of the structural integrity of the affected components. Therefore, relief is granted pursuant to 10 CFR 50.55a(g)(6)(i), is authorized by law and will not endanger life or property or the common defense and security, and is otherwise in the public interest giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility. The relief is granted pursuant to 10 CFR 50.55a(g)(6)(i) for the fourth 10-year ISI interval at Turkey Point Unit 4, which began April 15, 2004 and ended April 14, 2014.

All other ASME Code, Section XI requirements for which the request was not specifically requested and approved remain applicable, including third-party review by the Authorized Nuclear Inservice Inspector.

If you have any questions regarding this issue, please contact the Project Manager, Audrey Klett, at (301) 415-0489 or Audrey.Klett@nrc.gov.

Sincerely,

Benjamin G. Beasley, Chief
Plant Licensing Branch II-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-251

Enclosure:
Safety Evaluation

cc w/enclosure: Distribution via Listserv

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

# SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

# RELIEF REQUEST NO. 17

# FOR THE FOURTH 10-YEAR INSERVICE INSPECTION INTERVAL

# FLORIDA POWER & LIGHT COMPANY

# TURKEY POINT NUCLEAR GENERATING UNIT NO. 4

# DOCKET NO. 50-251

## 1.0 INTRODUCTION

By letter dated February 13, 2015,[1] as supplemented by letter September 25, 2015,[2] Florida Power & Light Company (FPL or the licensee) submitted Relief Request No. 17 for the fourth 10-year inservice inspection (ISI) interval of Turkey Point Nuclear Generating Unit No. 4 (Turkey Point Unit 4).

Pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR), Part 50, Section 55a(g)(5)(iii), the licensee requested the U.S. Nuclear Regulatory Commission (NRC) grant relief pertaining to the amount of coverage obtained during specific examinations compared to the coverage required by the American Society of Mechanical Engineers (ASME ) Code, Section XI.

## 2.0 REGULATORY EVALUATION

Pursuant to 10 CFR 50.55a(g)(4), ASME Code Class 1, 2, and 3 components (including supports) shall meet the requirements, except the design and access provisions and the preservice examination requirements, set forth in the ASME Code, Section XI, to the extent practical within the limitations of design, geometry, and materials of construction of the components. The regulations require that inservice examination of components and system pressure tests conducted during the first 10-year interval and subsequent intervals comply with the requirements in the latest edition and addenda of Section XI of the ASME Code, which was incorporated by reference in 10 CFR 50.55a(a) 12 months prior to the start of the 120-month interval, subject to the conditions listed in 10 CFR 50.55a(b)(2).

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[1] Agencywide Documents Access and Management System (ADAMS) Accession No. ML15062A279.
[2] ADAMS Accession No. ML15299A349.

10 CFR 50.55a(g)(5)(iii), states in, part that, that licensees may determine that conformance with certain ASME Code requirements is impractical and that the licensee shall notify the Commission and submit information in support of the determination. Determination of Impracticality in accordance with this section must be based on the demonstrated limitations experience when attempting to comply with the code requirements during the ISI interval for which the request is being submitted. Requests for relief made in accordance with this section must be submitted to the NRC no later than 12 months after the expiration of the initial 120-month inspection interval or subsequent 120-month inspection interval for which relief is sought.

10 CFR 50.55a(g)(6)(i), states that the Commission will evaluate determinations under paragraph (g)(5) of this section that code requirements are impractical. The Commission may grant such relief and may impose such alternative requirements as it determines is authorized by law and will not endanger life or property or the common defense and security and is otherwise in the public interest giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility.

The licensee has requested relief from ASME Code requirements pursuant to 10 CFR 50.55a(g)(6)(i). The ASME Code of record for Turkey Point Unit 4, fourth 10-year interval ISI program, which ended on April 14, 2014 for Unit 4, is the 1998 Edition, including the 2000 Addenda, of Section XI of the ASME Boiler and Pressure Vessel Code.

## 3.0 TECHNICAL EVALUATION

The information provided by the licensee in support of the request for relief from ASME Code requirements has been evaluated, and the bases for disposition are documented below. For clarity, the request has been evaluated in several parts according to ASME Code Examination Category.

### 3.1 Relief Request (RR) No. 17, Part A, ASME Code, Section XI, Examination Category B-D, Item B3.120, Full Penetration Welded Nozzles in Vessels

#### 3.1.1 ASME Code Requirement

ASME Code, Section XI, Examination Category B-D, Item B3.120, requires 100 percent volumetric examination as defined by Figures IWB-2500-7 (a) through (d), as applicable, of full penetration Class 1 pressurizer (PZR) nozzle inside radius sections as mandated by 10 CFR 50.55a(b)(2)(xxi)(A). ASME Code Case N-460, "Alternative Examination Coverage for Class 1 and Class 2 Welds, Section XI, Division 1," as an alternative approved for use by the NRC in Regulatory Guide 1.147, Revision 17, "Inservice Inspection Code Case Acceptability, ASME Section XI, Division 1" (RG 1.147, Revision 17), states that a reduction in examination coverage due to part geometry or interference for any Class 1 and 2 welds is acceptable, provided that the reduction is less than 10 percent (i.e., greater than 90 percent examination coverage is obtained).

3.1.2 Licensee's ASME Code Relief Request

In accordance with 10 CFR 50.55a(g)(5)(iii), the licensee requested relief from the ASME Code-required volumetric examination for the PZR nozzle inside radius Section SP-04-1-IR.

3.1.3 Licensee's Basis for Relief Request (as stated)

PZR Nozzle Inside Radius Sections – Inservice examinations limited due to raised letters in required scanning area.

3.1.4 Licensee's Proposed Alternative Examination

The licensee did not propose any alternative examinations for the subject welds. However, the licensee's examinations were performed to the maximum extent practical.

3.1.5 NRC Staff Evaluation

The ASME Code requires 100 percent volumetric examination of Class 1 PZR nozzle inside radius sections. However, the as-built fabrication and surface condition of the nozzles limited access for ultrasonic scanning. In order to effectively increase the examination coverage, the nozzle-to-vessel welds would require design modifications. This would place a burden on the licensee; thus, obtaining 100 percent of ASME Code-required volumetric examinations is considered impractical.

The PZR nozzle inside radius Section SP-04-1-IR is constructed of carbon steel material with stainless steel inside diameter surface cladding to minimize corrosion. As shown on the sketches and technical descriptions included in the licensee's submittals, examinations of the subject PZR nozzle inside radius sections have been completed to the extent practical, with volumetric coverage of 82.0 percent of the ASME Code-required volumes. The ultrasonic examinations were limited due to an area of 2 inches by 7 inches of raised letter stamping in the scanning area. The PZR inside radius section examinations were performed with 60-degree shear waves. A visual examination as allowed by 10 CFR 50.55a(b)(2)(xxi)(A) was considered as an alternative, but the spray nozzle assembly configuration inside the PZR prohibits access for examination. No recordable indications were observed during the volumetric examination of these welds.

The licensee has shown that it is impractical to meet the ASME Code-required 100 percent volumetric examination coverage for the subject PZR nozzle inside radius sections due to adjacent obstructions. Based on the volumetric coverage obtained for the subject welds, and considering the licensee's performance of ultrasonic techniques employed to maximize this coverage, it is reasonable to conclude that if significant service-induced degradation was present, evidence of it would have been detected by the examinations that were performed. Furthermore, the NRC staff determined that the examinations performed provide reasonable assurance of structural integrity of the subject welds.

3.2 RR No. 17 (Unit 4), Part B, ASME Code, Section XI Examination Category C-A, Items C1.10 and C1.20, Pressure Retaining Welds in Pressure Vessels

3.2.1 ASME Code Requirement

ASME Code, Section XI, Examination Category C-A, Items C1.10 and C1.20, require essentially 100 percent volumetric examination as defined by Figure IWC-2500-1 of the length of Class 2 circumferential shell and head welds. "Essentially 100 percent," as clarified by ASME Code Case N-460, is greater than 90 percent coverage of the examination volume or surface area, as applicable. ASME Code Case N-460 has been approved for use by the NRC in RG 1.147, Revision 17.

3.2.2 Licensee's ASME Code Relief Request

In accordance with 10 CFR 50.55a(g)(5)(iii), the licensee requested relief from the ASME Code-required volumetric examinations of the residual heat removal heat exchanger shell-to-flange and head-to-shell welds listed below in Table 3.2.1.

**Table 3.2.1 - Examination Category C-A (Unit 4)**

| Code Item | Weld ID | Weld Type | Coverage Obtained | Angle Modes |
|---|---|---|---|---|
| C1.10 | 4-RHE-A2 | Residual Heat Removal Heat Exchanger Shell-to-Flange Weld | 43.0% | 45, 60, 70S, 60L |
| C1.20 | 4-RHE-A1 | Residual Heat Removal Heat Exchanger Head-to-Shell Weld | 51.5% | 45, 60, 70S, 60L |

3.2.3 Licensee's Basis for Relief Request (as stated)

Residual Heat Removal Heat Exchanger Shell-to-Flange Welds - Inservice examination limited due to flange configuration. Shell side is limited due to nozzle reinforcements and welded attachments.

Residual Heat Removal Heat Exchanger Head-to-Shell Welds – Inservice examination limited due to support proximity to weld on head side and reinforcement plates and welded attachments on the shell side.

3.2.4 Licensee's Proposed Alternative Examination

The licensee did not propose any alternative examinations for the subject welds. However, the licensee's examinations were performed to the maximum extent practical.

3.2.5 NRC Staff Evaluation

The ASME Code requires essentially 100 percent volumetric examination of pressure retaining welds on selected Class 2 pressure vessels. However, for the subject welds on the Turkey Point Unit 4 residual heat removal heat exchangers, complete examinations are limited due to

the design configuration of these components and proximity of surrounding appurtenances. In order to achieve greater volumetric coverage, the residual heat removal heat exchanger would have to be redesigned and modified. This would place a burden on the licensee; therefore, the ASME Code examinations are considered impractical.

As shown on the sketches and technical descriptions included in the licensee's submittals, examinations of the residual heat removal heat exchanger flange-to-shell weld 4-RHE-A2 and head-to-shell weld and 4-RHE-A1 have been performed to the extent practical, with volumetric coverage ranging from approximately 43.0 to 51.5 percent (see Table 3.2.1 of the ASME Code-required volumes). The examinations are limited due to the flange configuration or supports within close proximity of the head and the nozzle reinforcement plates and welded attachments on the shell side. The residual heat removal heat exchanger is fabricated with stainless steel material. The licensee examined these welds using 45- and 60-degree shear waves and 45-degree refracted longitudinal waves (L-waves) to achieve partial circumferential and partial axial coverage along the weld length. L-waves have been shown to provide enhanced detection on the far-side of austenitic stainless steel welds.[3,4,5] While the licensee has only taken credit for limited volumetric coverage obtained from primarily one side of the weld, it is expected that the techniques employed would have provided coverage beyond the near-side of the residual heat exchanger flange-to-shell and head-to-shell welds. There were no recordable indications detected with the ultrasonic examinations employed.

The licensee has shown that it is impractical to meet the ASME Code-required volumetric examination coverage for the subject welds due to the design geometry of the components and proximity to adjacent obstructions. However, based on the volumetric coverage obtained, and the ultrasonic techniques employed, it is reasonable to conclude that if significant service-induced degradation was present in the subject welds, evidence of it would have been detected by the examinations performed. Furthermore, the NRC staff determined that the examinations performed provide reasonable assurance of structural integrity of the subject welds.

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[3] F.V. Ammirato, X. Edelmann, and S.M. Walker, Examination of Dissimilar Metal Welds in BWR [Boiling-Water Reactor] Nozzle-to-Safe End Joints, 8th International Conference on NDE [Non-Destructive Examination] in the Nuclear Industry, ASM International, 1987.

[4] P. Lemaitre, T.D. Koble, and S.R. Doctor, PISC [Programme for the Inspection of Steel Components] III Capability Study on Wrought-to-Wrought Austenitic Steel Welds: Evaluation at the Level of Procedures and Techniques, Effectiveness of Nondestructive Examination Systems and Performance Demonstration, PVP-Volume 317, NDE-Volume 14, ASME, 1995.

[5] M.T. Anderson, A.A. Diaz, A.D. Cinson, S.L. Crawford, S.E. Cumblidge, S.R Doctor, K.M. Denslow, and S. Ahmed, 2011. An Assessment of Ultrasonic Techniques for Far-Side Examinations of Austenitic Stainless Steel Piping Welds, NUREG/CR-7113, PNNL [Pacific Northwest National Laboratory]-19353, U.S. Nuclear Regulatory Commission, Washington, DC.

3.3 RR No. 17 (Unit 4), Part C, ASME Code, Section XI, Examination Category C-B, Item C2.21, Pressure Retaining Nozzle Welds in Class 2 Vessels

3.3.1 ASME Code Requirement

ASME Code, Section XI, Examination Category C-B, Item C2.21, requires 100 percent volumetric and surface examination, as defined by Figure IWC-2500-4(a) or (b), as applicable, of nozzle-to-shell (or head) welds in Class 2 vessels. ASME Code Case N-460, as an alternative approved for use by the NRC in RG 1.147, Revision 17, states that a reduction in examination coverage due to part geometry or interference for any Class 1 and 2 weld is acceptable, provided that the reduction is less than 10 percent (i.e., greater than 90 percent examination coverage is obtained).

3.3.2 Licensee's ASME Code Relief Request

In accordance with 10 CFR 50.55a(g)(5)(iii), the licensee requested relief from the ASME Code-required volumetric examination of residual heat removal outlet nozzle-to-shell weld 4-RHE-A11.

3.3.3 Licensee's Basis for Relief Request (as stated)

> Inservice examination limited to single side access due to nozzle configuration. Shell side is limited due to close proximity of flange to nozzle weld and weld crown configuration.

3.3.4 Licensee's Proposed Alternative Examination

The licensee did not propose any alternative examinations for the subject welds. However, the licensee's examinations were performed to the maximum extent practical.

3.3.5 NRC Staff Evaluation

The ASME Code requires 100 percent volumetric and surface examinations of Class 2 nozzle-to-shell (or head) welds. However, for the subject residual heat removal outlet nozzle-to-shell weld, complete examinations are limited due to the nozzle and weld crown configuration. In order to achieve greater volumetric coverage, the nozzle weld would have to be redesigned and modified. This would place a burden on the licensee; therefore, the ASME Code volumetric examination is considered impractical.

The subject residual heat removal outlet nozzle-to-shell weld 4-RHE-A11 is constructed of stainless steel materials. These full penetration butt welds extend the full thickness of the vessel head, and the nozzle configurations are of the "set in" design, which essentially makes the welds concentric rings aligned parallel with the nozzle axes. This nozzle design geometry restricts ultrasonic scanning mainly to the vessel side of the welds. Other limitations on the shell side are the proximity of the flange-to-nozzle weld and the weld crown configuration, which limit scanning access.

As shown on the sketches and technical description included in the licensee's submittal, examinations of the residual heat removal nozzle-to-shell weld have been completed to the extent practical with volumetric coverage of 53.5 percent of the ASME Code-required volume. The examination volume included the weld and base materials near the inside surface of the weld joints, which are high regions of stress, and where one would expect degradation sources to be manifested, should they occur. The outlet nozzle-to-shell weld examinations were performed with 45-, 60-, and 70-degree shear waves and 45- and 60-degree refracted L-waves. L-waves have been shown to provide enhanced detection on the far-side of austenitic stainless steel welds. While the licensee has only taken credit for limited volumetric coverage obtained from primarily one side of the weld, it is expected that the techniques employed would have provided coverage beyond the near-side of the residual heat removal nozzle-to-shell weld. No unacceptable indications were identified during the volumetric examination. The licensee completed the ASME Code-required liquid penetrant surface examination on the subject weld with no limitations. No recordable indications were identified during the surface examination.

The licensee has shown that it is impractical to meet the ASME Code-required 100 percent volumetric examination coverage for the subject nozzle-to-shell weld due to the nozzle design configuration and weld crown configuration. However, based on the volumetric and surface coverage obtained, it is reasonable to conclude that if significant service-induced degradation was present, evidence of it would be have been detected by the examinations performed. Furthermore, the NRC staff determined that the examinations performed provide reasonable assurance of structural integrity of the subject welds.

## 3.4 RR No. 17 (Unit 4), Part D, ASME Code, Section XI, Examination Category C-F-1, Items C5.11 and C5.21, Pressure Retaining Welds in Austenitic Stainless Steel or High Alloy Piping

### 3.4.1 ASME Code Requirement

ASME Code, Section XI, Examination Category C-F-1, Items C5.11 and C5.21, require 100 percent surface and volumetric examination, as defined by Figure IWC-2500-7, of selected Class 2 austenitic stainless steel or high alloy circumferential piping welds. ASME Code Case N-460, as an alternative approved for use by the NRC in RG 1.147, Revision 17, states that a reduction in examination coverage due to part geometry or interference for any Class 1 and 2 weld is acceptable, provided that the reduction is less than 10 percent (i.e., greater than 90 percent examination coverage is obtained).

### 3.4.2 Licensee's ASME Code Relief Request

In accordance with 10 CFR 50.55a(g)(5)(iii), the licensee requested relief from the ASME Code-required volumetric examination of the Class 2 austenitic stainless steel welds shown in Table 3.4.1.

| Table 3.4.1 - ASME Code, Section XI, Examination Category C-F-1 (Unit 4) | | | | |
|---|---|---|---|---|
| **Code Item** | **Weld ID** | **Weld Type** | **Percent Coverage Obtained** | **Angle Modes** |
| C5.11 | 8"-SI-2404-2 | Pipe-to-Valve | 50.0 | 45, 70 S, 60L |
| C5.11 | 8"-SI-2407-8 | Tee-to-Pipe | 76.0 | 45, 60, 70S, 60L |
| C5.11 | 10"-SI-2407-4 | Pipe-to-Valve | 50.0 | 45, 60, 70S, 60L |
| C5.11 | 10"-SI-2407-5 | Valve-to-Elbow | 50.0 | 45, 60, 70S, 60L |
| C5.11 | 12"-RHR-2402-15 | Pipe-to-Flange | 50.0 | 45, 60, 70S |
| C5.11 | 14"-RHR-2403-1 | Tee-to-Tee | 62.0 | 45, 60, 70S |
| C5.11 | 14"-RHR-2403-2 | Tee-to-Pipe | 81.0 | 45, 60, 70S |
| C5.11 | 14"-RHR-2403-4- | Elbow-to-Valve | 50.0 | 45, 60, 70S |
| C5.11 | 14"-RHR-2404-17 | Pipe-to-Tee | 81.0 | 45, 60, 70S |
| C5.21 | 3"-SI-2401-1 | Flange-to-Elbow | 45.4 | 45, 60, 70S |
| C5.21 | 3"-SI-2403-35 | Pipe-to-Elbow | 86.5 | 45, 60, 70S |
| C5.21 | 3"-SI-2403-36 | Elbow-to-Pipe | 66.0 | 45, 60, 70S |

3.4.3 Licensee's Basis for Relief Request (as stated)

Pipe-to-Valve, Elbow-to-Valve (all except for 3"-SI-2303-24): Inservice examination limited to single side access due to valve configuration.

Valve-to-Elbow (3"-SI-2303-24): Inservice examination limited to single side access due to valve configuration. Elbow limited on intrados due to curvature which limits contact.

Flange-to-Elbow: Inservice examination limited to single side access due to flange configuration. Elbow limited on intrados due to curvature which limits contact.

Pipe-to-Tee: Inservice examination limited to due to intrados of tee

Pipe-to-Elbow: Inservice examination limited due to intrados of elbow.

Pipe-to-Flange: Inservice examination limited to single side access due to flange configuration.

Tee-to-Tee: Inservice examination limited on both sides due to intrados of tee-to-tee configuration.

3.4.4 Licensee's Proposed Alternative Examination

The licensee did not propose any alternative examinations for the subject welds. However, the licensee's examinations were performed to the maximum extent practical.

3.4.5 NRC Staff Evaluation

The ASME Code requires 100 percent volumetric and surface examination for selected Class 2 pressure-retaining welds in austenitic stainless steel or high alloy circumferential piping. However, volumetric examinations are limited by the design geometry of the subject welds. To gain access for examination, the welds and associated piping would require design modifications. Imposition of this requirement would create a burden on the licensee; therefore, the ASME Code-required 100 percent volumetric examinations of the welds are considered impractical.

As shown on the sketches and technical descriptions included in the licensee's submittal, examinations of the subject welds have been performed to the extent practical with the licensee obtaining volumetric coverage ranging from of 45.4 to 86.5 percent (see Table 3.4.1 above). Access for examination of the subject piping welds is limited to primarily one side of these stainless steel welds due to valve or flange taper configurations, or curvature of the intrados of elbow and/or tee configurations.

Volumetric examinations on the subject welds were conducted with equipment, procedures, and personnel that have been performance-demonstrated to the requirements outlined in ASME Code Section XI, Appendix VIII. These techniques have been demonstrated for flaws located on the near-side of the welds; far-side detection of flaws is considered to be a "best effort." The licensee's ultrasonic scanning techniques included combinations of 45-, 60-, and/or 70-degree shear, and 45-, 60-, and/or 70-degree refracted L-waves, as applicable, on the subject welds. Performance demonstration initiative procedure demonstrations suggest that a 70-degree shear wave technique is appropriate for opposite side flaw detection for thicknesses equal to or less than 0.50 inches when examination scanning is limited to one side of the weld. Further, L-waves have been shown to provide enhanced detection on the far-side of austenitic stainless steel welds. While the licensee has only taken credit for limited volumetric coverage obtained from one side, it is expected that the techniques employed would have provided coverage beyond the near-side of the welds. No recordable indications were noted during the performance of the volumetric examinations. The licensee completed the ASME Code-required liquid penetrant surface examinations on the subject welds with no limitations per the requirements of ASME Code Case N-460. No recordable indications were identified during the surface examinations.

The licensee has shown that it is impractical to meet the ASME Code-required 100 percent volumetric examination coverage for the subject piping welds due to their design configurations. Although the ASME Code-required coverage could not be obtained, the ultrasonic techniques employed would have provided full volumetric coverage for the near-side of the welds and

limited volumetric coverage for the weld fusion zone and base materials on the opposite side of the welds. Based on the aggregate volumetric coverage and surface coverage obtained for the subject welds, it is reasonable to conclude that if significant service-induced degradation was present, evidence of it would have been detected. Furthermore, the NRC staff determined that the examinations performed provide reasonable assurance of structural integrity of the subject welds.

## 3.5 RR No. 17 (Unit 4), Part E, ASME Code, Section XI, Examination Category R-A, Item R1.11, Risk Informed Piping Examinations

### 3.5.1 ASME Code Requirement

The examination requirements for the subject piping welds at Turkey Point Unit 4 are governed by a risk-informed inservice inspection (RI-ISI) program that was approved by the NRC in a safety evaluation (SE) dated December 9, 2008.[6] The RI-ISI program was developed in accordance with the Westinghouse Owners Group Topical Report (TR) WCAP-14572, "Westinghouse Owners Group Application of Risk-Informed Methods to Piping Inservice Inspection Topical Report," Revision 1-NP-A. As part of the NRC-approved program, the licensee has implemented inspection requirements listed in WCAP Table 4.1-1, Examination Category R-A, Risk-Informed Piping Examination, with more detailed provisions contained in TR-14572. The TR includes a provision for requesting relief from volumetric examinations if 100 percent of the required volumes cannot be examined.

Table 4.1-1 of WCAP-14572 assigns Examination Category R-A, Item R1.11, to elements subject to a thermal fatigue damage mechanism. Table 4.1-1 requires 100 percent of the examination location volume, as described in Figures IWB-2500-8(c), -9, -10, or -11, as applicable, including an additional ½ inch of base metal adjacent to the ASME Code volume, be completed for selected Class 1 piping welds. ASME Code Case N-460, as an alternative approved for use by the NRC in RG 1.147, Revision 17, states that a reduction in examination coverage due to part geometry or interference for any Class 1 and 2 weld is acceptable, provided that the reduction is less than 10 percent (i.e., greater than 90 percent examination coverage is obtained).

### 3.5.2 Licensee's ASME Code Relief Request

In accordance with 10 CFR 50.55a(g)(5)(iii), the licensee requested relief from 100 percent of the ASME Code-required inspection volumes for Class 1 piping welds shown in Table 3.5.1 below.

**Table 3.5.1 - Examination Category R-A (Unit 4)**

| Code Item | Weld ID | Weld Type | Percent Coverage Obtained |
|---|---|---|---|
| R1.11 | 31"-RCS-1402-6 | Elbow-to-Pipe | 78.8 |
| R1.11 | 31"-RCS-1403-8 | Elbow-to-Pipe | 85.5 |

[6] ADAMS Accession No. ML083250173.

3.5.3 Licensee's Basis for Relief Request (as stated)

Reducer-to-Valve: Inservice examination limited to single side access due to valve configuration.

Elbow-to-Pipe: Inservice examination limited due to elbow OD [outside diameter] geometry.

3.5.4 Licensee's Proposed Alternative Examination

The licensee did not propose any alternative examinations for the subject welds. However, the licensee's examinations were performed to the maximum extent practical.

3.5.5 NRC Staff Evaluation

The examination requirements for the subject piping welds at Turkey Point Unit 4 are governed by an RI-ISI program that was approved by the NRC in an SE dated December 9, 2008. This program assigns Examination Category R-A, Item R1.11, to piping elements subject to a thermal fatigue mechanism. The program requires inspection of 100 percent of the examination location volume for the subject circumferential piping welds. However, the design configurations of these welds limit volumetric examinations. In order to increase coverage, the welds would have to be redesigned and modified. This would place a burden on the licensee; therefore, the ASME Code-required volumetric examinations are considered impractical.

As shown in the technical descriptions and sketches provided in the licensee's submittal, examinations of the subject welds have been performed to the extent practical, with the licensee obtaining volumetric coverage ranging from approximately 78.8 to 85.5 percent (see Table 3.5.1) of the ASME Code-required volumes. The limitations encountered during the performance of the ultrasonic examinations were caused by cast stainless steel materials, taper of the valve in the reducer-to-valve, and elbow OD transition geometry in the elbow-to-pipe configurations. These configurations limit the volumetric examinations primarily to the pipe or reducer side of the welds. Volumetric examinations on the subject welds were conducted with equipment, procedures, and personnel that have been performance-demonstrated to the requirements outlined in ASME Code, Section XI, Appendix VIII. These techniques have been demonstrated for flaws located on the near-side of the welds; far-side detection of flaws is considered to be a "best effort." The licensee's ultrasonic scanning techniques included combinations of 45-, 60-, and 70-degree shear, and 45-degree refracted L-waves, as applicable, on the subject welds. L-waves have been shown to provide enhanced detection on the far-side of austenitic stainless steel welds. Therefore, while the licensee has only taken credit for obtaining limited volumetric coverage, it is expected that the techniques employed would have provided coverage beyond the near-side of the welds. The ultrasonic examinations had no recordable indications.

The licensee has shown that it is impractical to meet the ASME Code-required inservice volumetric examination coverage for the subject welds due to their design geometries and fabrication materials. Although the ASME Code-required coverage could not be obtained, the ultrasonic techniques employed would have provided full volumetric coverage for the near-side

of the welds and limited volumetric coverage for the weld fusion zone and base materials on the opposite side of the welds. Based on the ultrasonic results and coverage obtained, it is reasonable to conclude that if significant service-induced degradation was present in the subject welds, evidence of it would have been detected by the examinations performed. Furthermore, the NRC staff determined that the examinations performed provide reasonable assurance of structural integrity of the subject welds.

## 4.0 CONCLUSION

Based on the review of the submittals, the NRC staff concluded that compliance with the ASME Code coverage requirements is impractical for the configurations identified in the subject relief requests, and that compliance with the specified requirements would result in a burden on FPL. The NRC staff also concluded that the examination coverages obtained by the licensee provide reasonable assurance of the structural integrity of the affected components. Therefore, relief is granted pursuant to 10 CFR 55.a(g)(6)(i), is authorized by law and will not endanger life or property or the common defense and security, and is otherwise in the public interest, giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility. The relief is granted pursuant to 10 CFR 55.a(g)(6)(i) for the fourth 10-year ISI interval at Turkey Point Unit 4, which began April 15, 2004, and ended April 14, 2014.

All other ASME Code, Section XI requirements for which relief was not specifically requested and approved in the subject request for relief remain applicable, including third-party review by the Authorized Nuclear Inservice Inspector.

Principal Contributor: Thomas K. McLellan, Steve Cumblidge, and Austin Young.

Date: December 23, 2015

If you have any questions regarding this issue, please contact the project manager, Ms. Audrey Klett, at (301) 415-0489 or by e-mail at Audrey.Klett@nrc.gov.

Sincerely,

***/RA/***

Benjamin G. Beasley, Chief
Plant Licensing Branch II-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-251

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